

Mapping Research Trends in Technical and Vocational Education and Training (TVET): A Bibliometric Analysis (2000–2025)

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Research trends, RStudio,
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Abstract

This study aims to provide a clear picture of Technical and Vocational Education and Training (TVET) worldwide. As for the job market and skills requirements change quickly, it is important to understand how research in this field has grown and what trends are emerging. By knowing this, educators, policymakers and researchers like us can better focus on what matters most in skills-based education.

To carry out the study, 644 research documents from year 2000 to 2025 were collected from Lens.org website. The study focuses on three main journals: the Journal of Vocational Education and Training, the International Journal for Research in Vocational Education and Training, and the Journal of Technical Education and Training. Data were analyzed using RStudio with the Bibliometrix package and VOSviewer to find patterns and connections. Citation analysis helped identify the most active authors, important publications and influential works. Co-authorship and keyword analyses were used to map how researchers collaborate and to track the main topics and themes in TVET research overtime.

The study found that research output was steady in the early 2000s but has increased significantly over the past ten years, reflecting a growing global interest in vocational education. Certain countries, journals, and highly cited studies were identified as major contributors shaping the field. Collaborative networks among researchers were also observed, showing how knowledge spreads and develops.

In conclusion, while many countries are investing in TVET research, some regions have become leading centers of knowledge. The findings provide valuable insights for those involved in education and training by highlighting current research trends, key topics, and areas where more studies are needed.

Introduction Technical and Vocational Education and Training (TVET) is essential for preparing people with the skills needed in today's fast changing job market. As industries evolve and new technologies emerge, having a workforce with the right skills is more important than ever. According to United Nations Educational, Scientific and Cultural

Organization (UNESCO 2015), TVET plays a key role in improving employability and supporting economic development. Similarly, International Labor Organization (ILO) 2019 emphasized that skills development is important in responding to changes in the labor market.

This study aims to fill that gap by looking at research published from 2000 to 2025, focusing on three major journals: the Journal of Vocational Education and Training, the International Journal for Research in Vocational Education and Training, and the Journal of Technical Education and Training. By examining these sources, the study highlights trends, influential authors, key research topics and collaboration network that have shaped TVET over time. Similar bibliometric studies in education such as those by Aria and Cuccurullo (2017), show that analyzing publication data can help identify research trends and knowledge development.

The three journals were selected because they are well-recognized and focused specifically on Technical and Vocational Education and Training (TVET). The Journal of Vocational Education and Training is one of the oldest and most established journals in the field, providing a strong foundation of research and widely cited studies. It is indexed in scopus and web of science, which shows its quality and credibility. The International Journal for Research in Vocational Education and Training offers more recent and globally focused research, making it useful for understanding current trends and developments. It is also indexed in Scopus and Web of Science (ESCI), ensuring good research visibility. Meanwhile, the Journal of Technical Education and Training provide an insight related to skills development and technical training, especially in practical settings and is indexed in scopus.

Objectives of the Study

The objectives of this study are to understand and examine the growth and development of TVET research, to identify leading authors, journals, and countries contributing to the field, and map the collaboration networks and thematic focus. To guide the study, three research questions were posed.

RQ1. How has TVET research evolved globally from 2000 to 2025?

RQ2. Which authors, journals, and countries have been most influential in shaping TVET research?

RQ3. What are the main research topics and collaboration patterns in the field?

By answering these questions, this study provides valuable insights for educators, policymakers, and researchers, helping them see the current state of TVET research and identify areas that need more attention

Methodology

This study used bibliometric methods to examine the development of research in technical and vocational education and training (TVET). Bibliometric methodology is a quantitative approach that combines statistical and mathematical methods to analyze the connections between researches in a particular discipline (Broadus, 1987; Hood & Wilson, 2001; Pritchard & Y Wittig, 1981). Bibliometric techniques are widely used in education

research to identify trends, influential authors, collaboration patterns and key topics (Aria & Cuccurullo, 2017; Donthu et al., 2021). Citation analysis was applied to determine the most cited and influential articles, authors and journal, highlighting studies that have significantly shaped TVET research (Tahamtan et al. 2016). Co-authorship analysis was conducted to examine collaboration networks among researchers and institutions, showing how knowledge is shared and developed globally (Glanzel & Schubert, 2004). Keyword co-occurrence analysis helped identify recurring themes and emerging research topics, revealing the evolution of the field (Zupic & Cater, 2015). The data were collected from the lens.org database, covering publications from 2000-2025. The study focused on the three major journals: the Journal of Vocational Education and Training, the International Journal for Research in Vocational Education and Training, and the Journal of Technical Education and Training. These journals were selected for their relevance, quality and indexing in scopus and in some cases in web of science (WoS), ensuring credibility and visibility of research. For analysis and visualization, RStudio with the Bibliometrix package was used to perform detailed bibliometric calculations and map research trends. VOSviewer was used to create visual maps of author collaborations, keyword relationships, and network structures, helping to clearly show patterns and connections within TVET research (van Eck & Waltman, 2010).

Data Collection

In this study, data were collected from Lens.org, a comprehensive database that provides access to a wide range of scientific publications. lens.org is widely used in bibliometric studies because it offers citation information and coverage across multiple disciplines, including education and vocational training (Burnham, 2006); Meho & Yang, 2007). The study focused on publications from 2000-2025 and specifically targeted three key journals, the Journal of Vocational Education and Training, the International Journal for Research in Vocational Education and Training, and the Journal of Technical Education and Training. These journals were selected because they are well-recognized in the field of TVET, indexed in scopus, and in some cases, web of science, ensuring quality and credibility. To ensure the reliability of the data, several filters were applied in lens.org: only open access publications, those with abstracts and cited by scholarly works. Additionally, the identifier types DOI, Core and openAlex were selected to provide consistent and accurate references. After applying these criteria, a total of 644 documents were exported to .csv file and included in the study for analysis.

Data Analysis

The collected data were analyzed using RStudio with the Bibliometrix package, VOSviewer, and Microsoft Excel to explore research trends, collaborations, and key topics in technical and vocational education and training (TVET). Bibliometric methods help provide a clear picture of the field's development and identify influential authors, journals, and countries (Aria & Cuccurullo, 2017; Donthu et al., 2021). The following analyses were conducted: Citation analysis identified the most cited and influential authors, journals, and publications, highlighting studies that shaped TVET research (Tahamtan et al., 2016). Co-authorship and collaboration networks examined relationships between researchers and institutions, showing how knowledge is shared globally (Glanzel & Schubert, 2004). Keyword co-occurrence, occurrence frequency, and trend topics revealed common themes and emerging research areas. (Zupic & Cater, 2015).

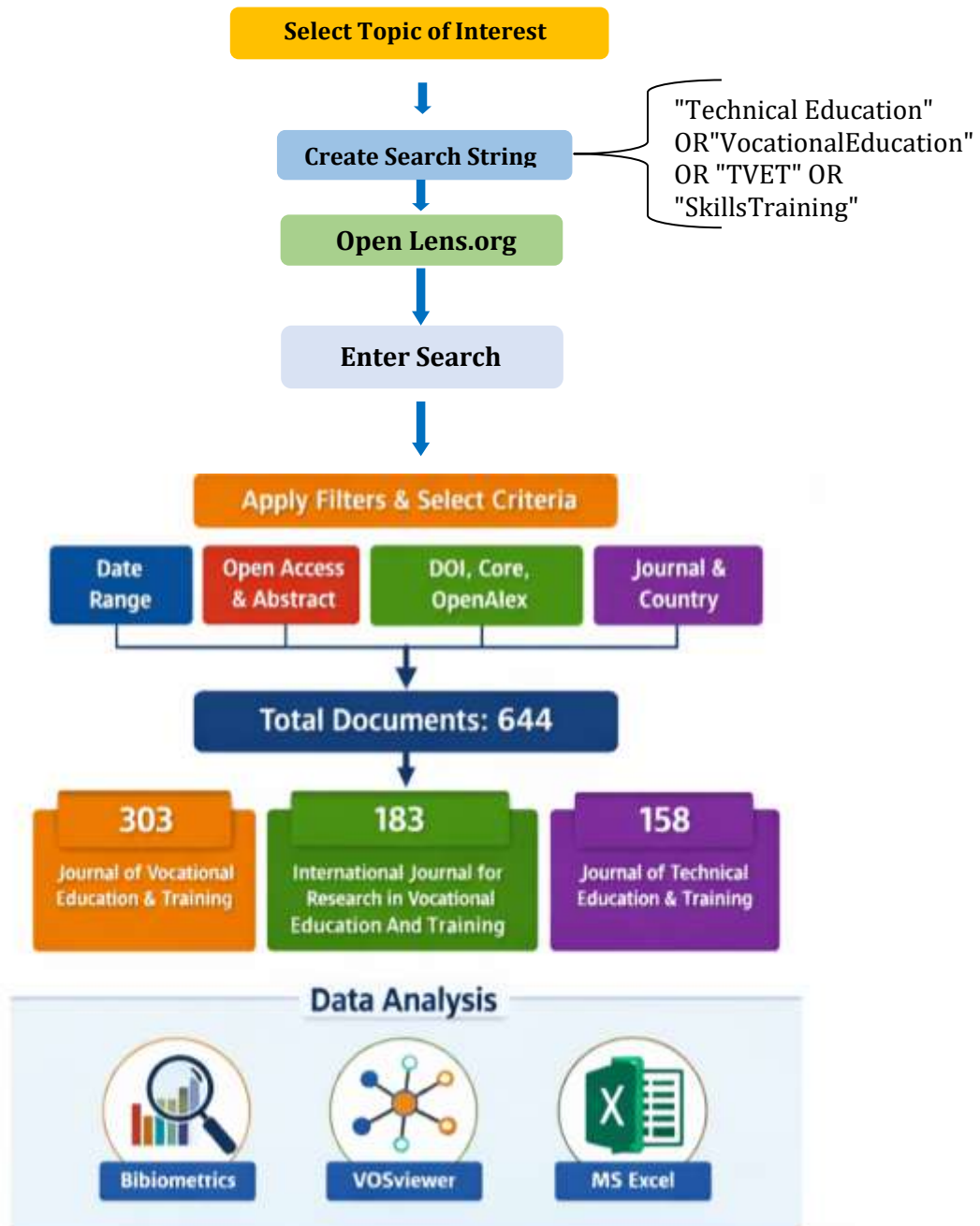
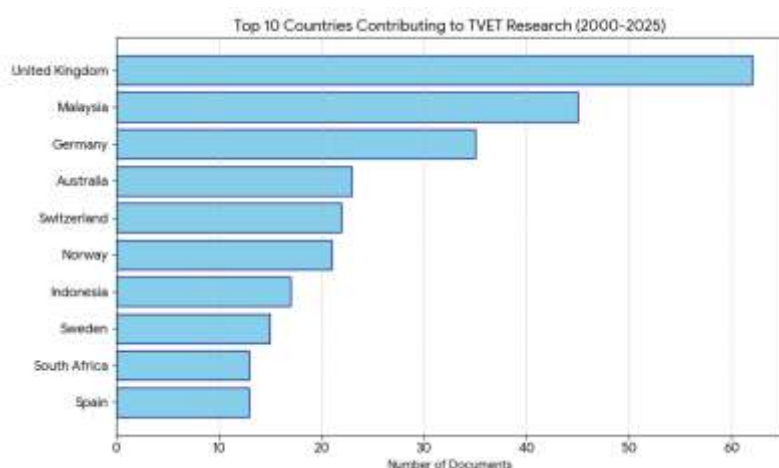


Figure 1. Research Process

Thematic map and factorial map visualized clusters of research themes and their relationships, helping to understand the structure of TVET knowledge. Network visualization was used to map the interactions and relationships among authors, journals, keyword and countries, providing a visual overview of collaborations and research patterns. Production over time, annual scientific production, life cycle of scientific production, and average citations per year illustrated the growth and impact of TVET research. Most local cited authors and most relevant authors identified key contributors, while most relevant sources highlighted influential journals in the field and Countries map visualized global contributions and collaborations in TVET research. In VOSviewer, circulate nodes represented authors, journals, or countries. Node size reflected influence or publication count, while connecting lines represented relationships or collaborations. Thicker lines indicated stronger connections. Making patterns cluster, and networks easier to interpret (van Eck & Waltman, 2010). The research process began by selecting

the topic of interest and developing a specific search string to ensure all relevant publications were captured. Using the lens.org database, a systematic search was conducted, applying filters for a specific date range (2000-2025), open access availability, and verified document identifiers like DOI's. This process resulted in a final sample of 644 documents for analysis. A significant portion of these records came from three leading sources: the Journal of Vocational Education and Training (303 Articles), the International Journal for Research in Vocational Education and Training (183 articles), and the Journal of Technical Education and Training (158 articles). To interpret the data, three primary tools were used. Microsoft Excel handled the initial data cleaning and organization, while the Bibliometrix package in RStudio was used to calculate publication trends and author productivity. Finally, VOSviewer was employed to create visual maps of the research networks, identifying the most common themes and collaborative links within the TVET field

Results and Findings



The analysis of 644 documents/articles from year 2000-2025 shows a steady growth in TVET research, with a sharp increase in publications after 2015. This suggests that vocational education has gained significant global attention in the last decade.

Figure 2. Top 10 Countries contributing to TVET Research (2000-2025)

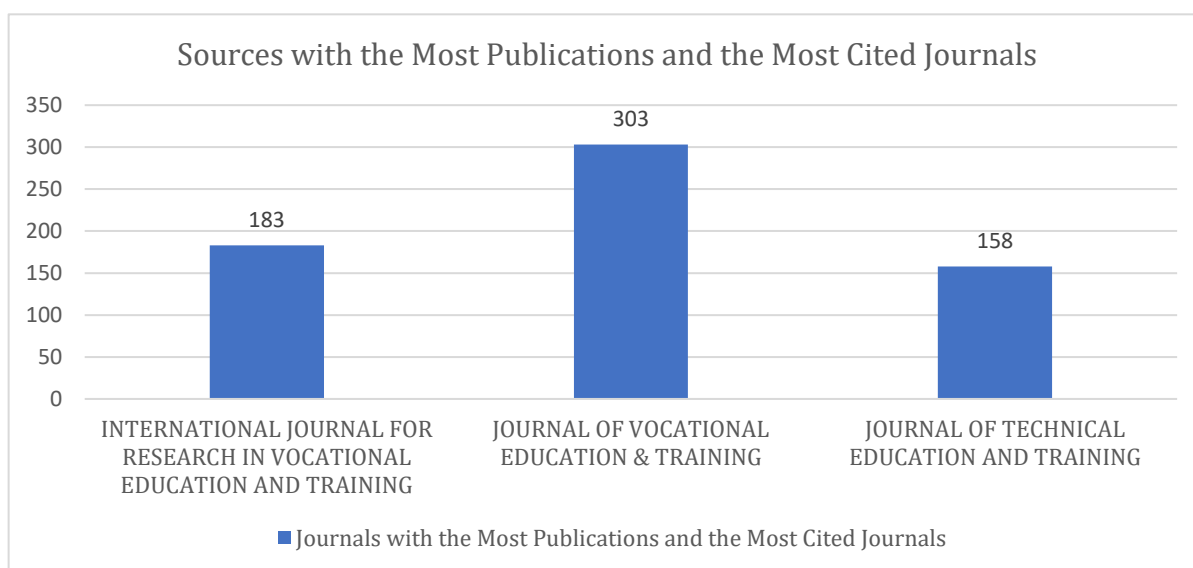


Figure 3. Sources with Most Publications and Most Cited Journals

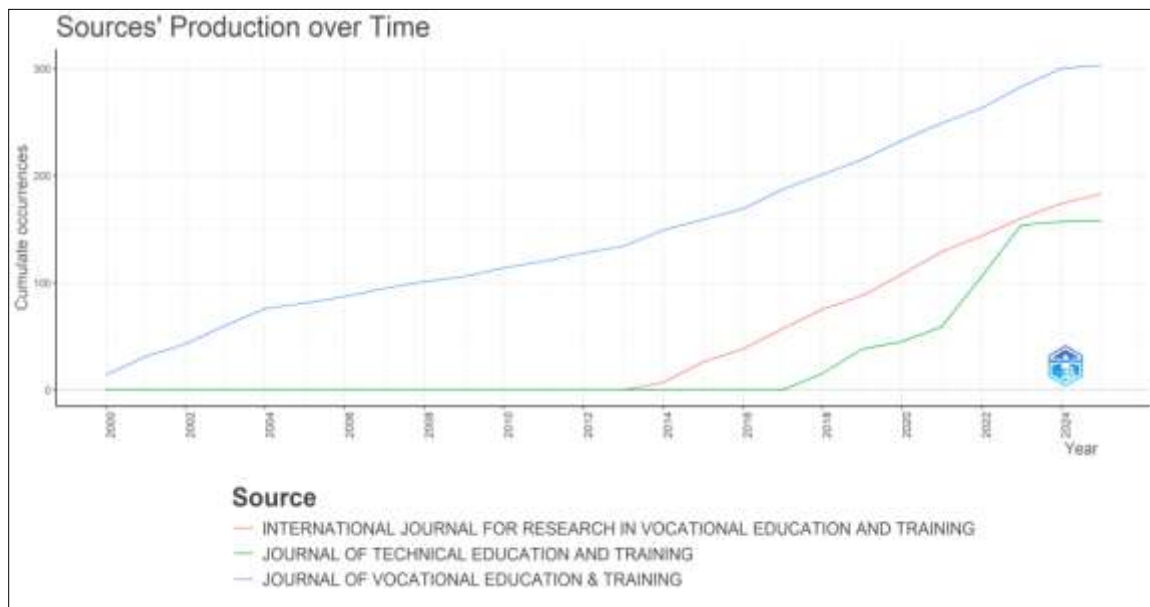


Figure 4. Sources Production over Time

The data shows that the journal of Vocational Education & Training is the most influential source, contributing nearly half of the total database (303 articles). Geographically, while research is distributed globally, a few key countries and institutions dominate the field. By using Bibliometrix in RStudio, we identify the most prolific authors who have consistently published high-impact work. These influential authors and their most cited papers serve as the intellectual foundation of the field, focusing heavily on how vocational training adapts to changing labor markets.

Emerging trends in TVET Research, the findings highlight several “*Hot topics*” that have emerged in the most recent five-year period (2020-2025). There is a clear shift toward green TVET, which focuses on environment sustainability in vocational training. Additionally, digital transformation has become a dominant theme, as a researchers look for ways to include artificial intelligence and remote learning in hands-on technical fields. Finally, there is an increasing focus on social inclusion, specifically how TVET can provide better opportunities for marginalized groups and lifelong learners. Based on the analysis of 644 documents retrieved from lens.org, the following graph highlights the top 10 countries that have contributed most significantly to the TVET research landscape between 2000-2025.

The data shows that the United Kingdom leads the field with the highest number of contributions, followed closely by Malaysia and Germany. This distribution reflects the strong vocational traditions in these regions particularly the dual education system in Germany and the robust technical training frameworks in Southeast Asia and the UK. Countries like Australia, Norway, and Switzerland also appear as major players, indicating a high level of research interest in vocational systems across Europe and the Commonwealth. The presence of Indonesia and South Africa in the top 10 further demonstrates that TVET is a critical area of study for emerging economies looking to bridge the skills gap through technical education.

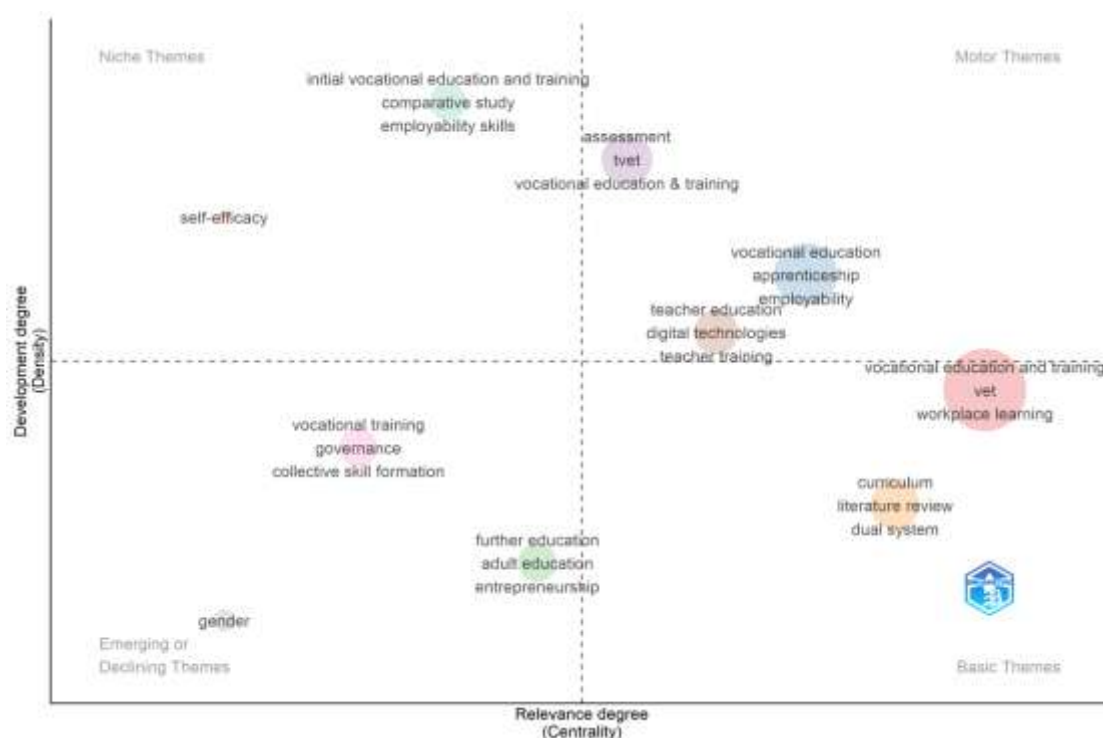


Figure 5. Thematic Map of Keywords

The analysis of the field's thematic structure used a strategic diagram. This method groups research topics based on two factors: development (density) and importance (centrality). It helps identify which topics are well-developed, widely used, or still emerging. The results show that “vocational education and training,” “TVET,” and “assessment” are motor themes. These topics are both well-developed and highly important in current research. They play a central role in shaping the direction of the field. This finding is supported by UNESCO (2012), which highlights TVET as a key area for improving education systems and supporting economic development. On the other hand, “workplace learning,” “curriculum,” and the “dual system” are identified as basic themes.

These topics are widely studied and form the foundation of TVET research, but they are not considered highly specialized. According to Stephen Billett (2011), workplace learning is essential for skill development, as it connects classroom learning with real work experience. The analysis also shows that “self-efficacy” and “employability skills” are niche themes. These topics are well-developed but less connected to other major themes in the field. Research by Albert Bandura (1997) explains that self-efficacy plays an important role in how learners perform and succeed, especially in skill-based education. However, these topics may need stronger integration with broader TVET research.

Lastly, “gender,” “adult education,” and “entrepreneurship” are classified as emerging or declining themes. This means that these topics are either still developing or currently receiving less attention. Studies such as those by Simon McGrath et al. (2020) suggest that these areas may grow in importance in the future, especially as TVET continues to respond to social and economic changes. Overall, the thematic map shows that TVET research is well-structured, with strong core topics and several developing areas. It

highlights the need to strengthen connections between themes to support a more balanced and inclusive research field.

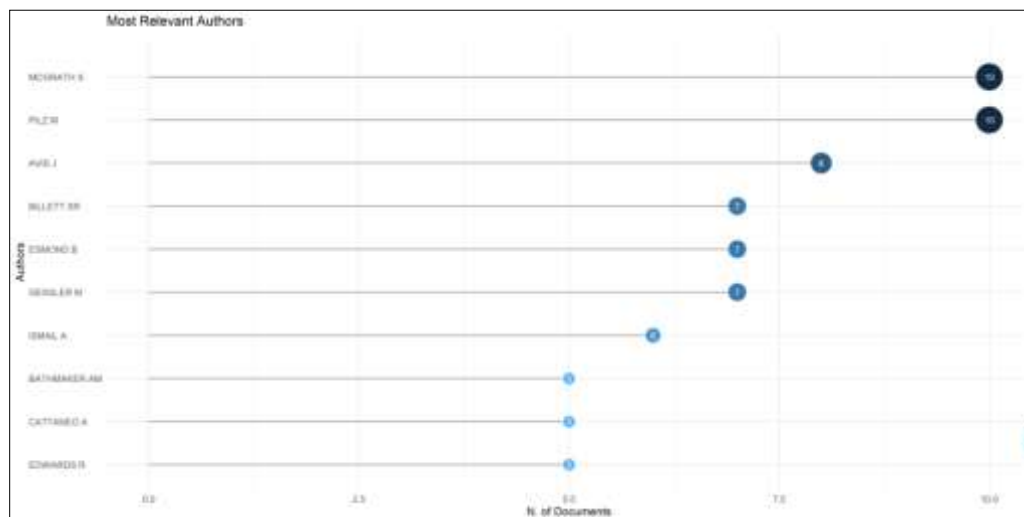


Figure 6. Most Relevant Authors

The productivity of individual authors was examined to identify the top researchers in the dataset. The findings reveal that Simon McGrath and Matthias Pilz are the most productive authors, each with 10 publications. They are followed by James Avis, who has 8 publications. A group of authors, Stephen R. Billett, Bill Esmond, and Michael Gessler, each contributed 7 publications. Other significant contributors include Abdul Rahman Ismail with 6 publications, while Ann-Marie Bathmaker, Alberto Cattaneo, and Richard Edwards each have 5 publications. This distribution shows that a small group of active researchers plays a key role in shaping the field. Their ongoing work helps guide research trends and contributes to the growth of knowledge in TVET. The Most Relevant Authors analysis shows how productive the top researchers are by looking at how many papers they have published in the dataset. It finds the people who are most active in the field. The results indicate that McGrath S. and Pilz M. are the most prolific authors, each having published 10 works. Next is Avis J. with eight published works.

<i>Author</i>	<i>Article Title</i>	<i>Source</i>	<i>Total Citations</i>	<i>Annual Citations</i>
Billett SR	The standing of vocational education: sources of its societal esteem and implications for its enactment	Journal of Vocational Education & Training	135	10
Pilz M	International transfer of vocational education and training: a literature review	Journal of Vocational Education & Training	127	25
McGrath S	Vocational education and training for African development: a literature review	Journal of Vocational Education & Training	88	13
Cattaneo A	The 'Erfahrungsraum': a pedagogical model for designing educational technologies in dual vocational systems	Journal of Vocational Education & Training	67	6
Gessler M	The lack of collaboration between companies and schools in the German dual apprenticeship system	International Journal for Research in VET	53	6

education (Pilz, Matthias, 2012) are found in the upper part of the map. These show studies about how vocational education connects with colleges and universities. Teaching and Teacher Development, in the lower-right part, terms like pedagogy, teacher training; vocational teachers and curriculum innovation appear. These focus on how teaching is done and how teachers improve their skills in VET. Skills and Employment, the word such as employability, skills, work-based learning, and industrial revolution 4.0 show the connection between education and jobs. These studies focus on preparing students for real work situations. The conceptual structure map further shows that this growing research field is built in three main areas. First is system integration, which focuses on connecting vocational education with higher education to provide clear learning pathways for students. Second is vocational pedagogy, which highlights the need for proper teaching methods, teacher training, and improved curriculum in technical education (Gamble, Jeanne (2013). Third is the focus on Industry 4.0 and employability, showing that TVET is closely linked to labor market needs and demand for modern skills. It shows that TVET has developed into a strong and multidisciplinary field. It now combines academic knowledge with practical skills, ensuring that education meets both learning goals and real-world industry demands. Marope, P.T.M., Chakroun, Borhene, and Holmes, Kenneth P. (2015),

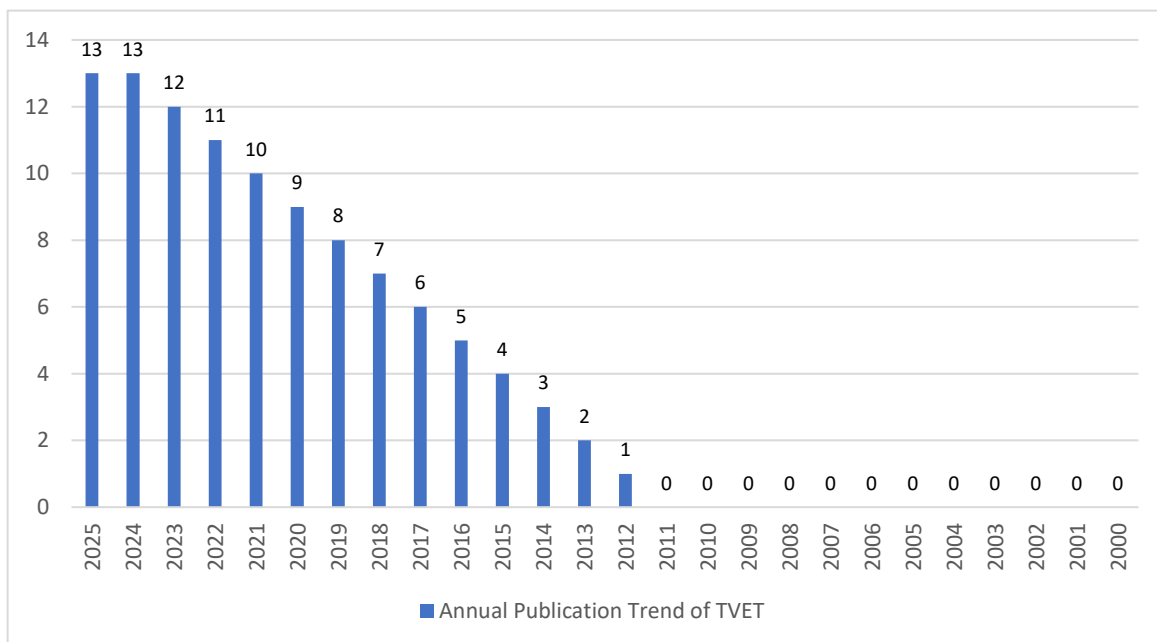


Figure 8. Annual Publication Trend of TVET

The Annual Publication Trend shows that research using the “TVET” label was almost absent before 2012. This year can be considered a turning point in the field. The change was influenced by the Shanghai Consensus (UNESCO, 2012), a global policy effort that standardized the use of the term “TVET” and raised the importance of vocational education. From being seen as a second option, TVET became recognized as a key driver of economic growth and sustainable development. After 2012, there was a clear increase in research output.

The sources production graph shows this rapid growth, with journals such as the Journal of Technical Education and training publishing more studies. This period can be described

as a “renaissance” in TVET research, as more scholars began to align their work with global standards and priorities.

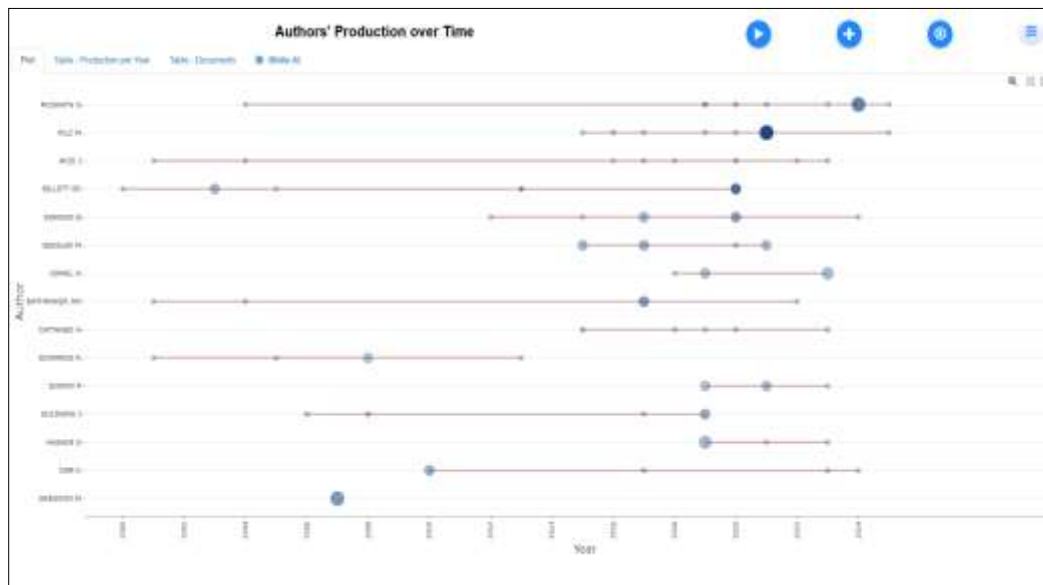
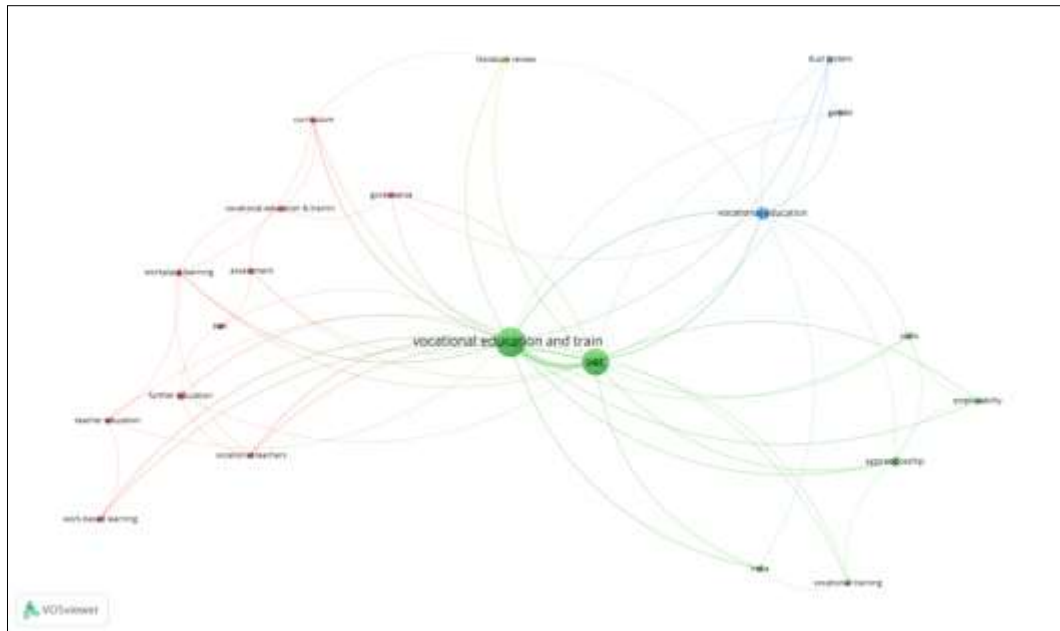


Figure 9. Authors' Production over Time

The TOP Authors Production over Time graph provides an overview of the publishing patterns of these top authors throughout history (2000 – 2025). This graph assists in determining when authors are most active and also how their influence has changed over time. On the graph, each line represents an author and each bubble represents the year that an author published a work. The larger the bubble, the more works that were published by that author in a given year; darker colored bubbles correspond to authors that are highly cited. From this graph, it is clear that Billett S. R., Avis J. and Edwards R. are authors who have had long and continuous research careers; all authors began publishing in the early 2000s with Billett S. R. being particularly active in 2003 and at his most highly cited point in 2020. More recently, McGrath S. and Pilz M. are also highly productive authors; McGrath S. has demonstrated an overall peak of productivity in 2023, while Pilz M.'s most highly cited publication occurred in 2021. Cattaneo A. and Esmond B. have been publishing steadily and continuously since 2015 which indicates they are making consistent contributions to current research. Sheet of activity by authors such as Hashim S. and Gulikers J. have all been numerous in their publications around 2019 which would be a time when they contributed more significantly to the field. The graph illustrates both long-established author(s) as well as newly-accomplished, demonstrating the increase and growth of the field over time.

The VOSviewer co-occurrence network map illustrates the relationships among key keywords in Vocational Education and Training (VET) research. Node size reflects keyword frequency, while link thickness indicates the strength of co-occurrence between terms. The most dominant keywords are “vocational education and training” and “VET,” which serve as central hubs of the network. Other frequently used terms include “vocational education” and “curriculum,” indicating their strong relevance in the field. The map reveals four main thematic clusters.



The red cluster focuses on pedagogy and instruction, highlighting teacher education, workplace learning, assessment, and vocational teachers. The green cluster centers on employability and industry linkages, including skills, apprenticeship, and vocational training, with a contextual reference to India. The blue cluster represents systems and social dimensions, such as dual system, gender, and vocational education. The yellow cluster features literature review, acting as a bridging methodological theme across clusters. Strong co-occurrence links are observed between major terms, particularly between “vocational education and training” and “VET,” indicating their frequent interchangeability and central role in the literature.

Overall, the network shows a highly interconnected research structure, with strong emphasis on workplace learning, teacher education, and curriculum development, reflecting the field's focus on pedagogy, employability, and system-level issues in VET.

The co-occurrence network reveals that vocational education and training (VET) serves as the central theme, with strong linkages to key concepts such as skills, employability, and apprenticeship. This indicates that the primary focus of existing studies is on enhancing learner's competencies and improving labor market outcomes. The identified clusters further highlight important dimensions of VET research. The skills-related cluster emphasizes workforce readiness, while another cluster focusing on curriculum, assessment, and teachers underscores the importance of instructional quality and workplace-based learning.

Additionally, the presence of terms such as gender and dual system reflects ongoing research on inclusivity and structural models of vocational education. Overall, the findings suggest that VET research is multidimensional, integrating skills development, pedagogical practices, and system-level improvements to address both educational and employment needs.

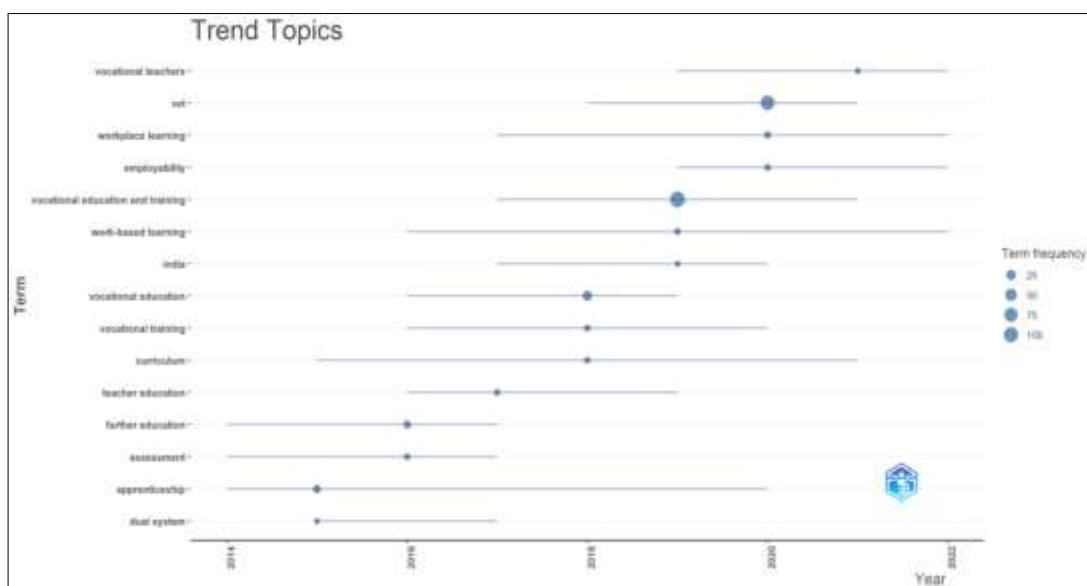


Figure 11. Trend Topics

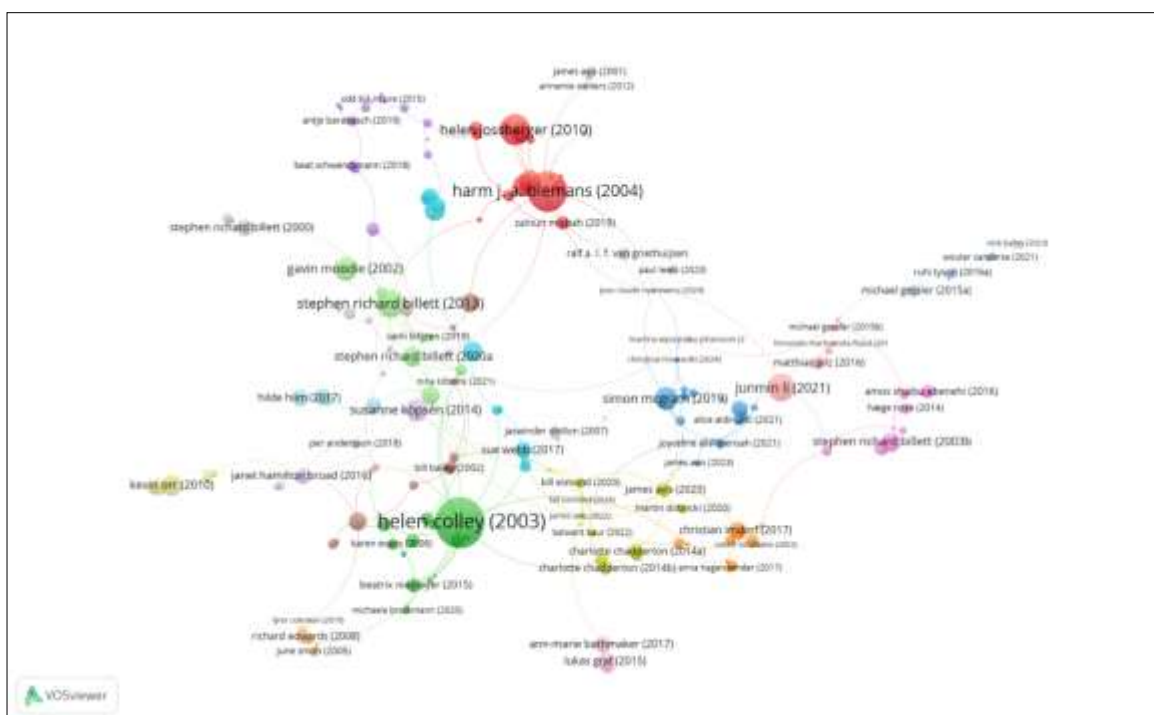


Figure 12. Co-Authorship network visualization

This image shows Co-authorship network visualization created using VOSviewer. It illustrates how authors in a research field collaborate. Each circle represents an author, and the lines indicate their shared publications. Larger circles mean that the author has more collaborations or publications. The network demonstrates that the research field is very collaborative. Authors are grouped into clusters, represented by different colors, which show teams or groups of researchers working on similar topics. For example, Helen Colley and Harm J. A. Biemans are key authors because they have many connections with others. Their clusters indicate strong collaboration with co-authors like Beatrix Niemeyer, Karen Evans, and Helen Jossberger. Some smaller clusters are also visible, which may indicate new or specialized research areas. The presence of different clusters suggests that the field is active and continues to grow. This type of network supports the idea that

research relies on collaboration. Mark Newman (2004) stated that co-authorship networks demonstrate how researchers share knowledge and ideas.

The large nodes in the map reflect what Robert K. Merton (1968) described as the "Matthew Effect," where well-known researchers gain more collaboration over time. Additionally, some authors act as bridges between groups, helping to connect different ideas. Simon McGrath is an example of a researcher who links various clusters.

Ronald Burt (2004) explained that these "bridging" authors play an important role in sharing new ideas across groups. Overall, the map shows that the research field, particularly in Technical and Vocational Education and Training (TVET), is collaborative, growing, and globally connected. It emphasizes the importance of teamwork in producing knowledge and improving research quality.

Discussion

This study provides a comprehensive bibliometric overview of Technical and Vocational Education and Training (TVET) research from 2000 to 2025, revealing significant developments in publication trends, scholarly influence, and thematic evolution. The findings indicate a steady increase in research output, with a notable surge after 2015. This growth reflects the rising global recognition of TVET as a critical driver of workforce development and economic sustainability. Similar trends have been observed in prior bibliometric studies, which emphasize that the expansion of research output is often linked to increasing policy attention and global demand for skills development (Donthu et al., 2021). In addressing the first research question, the results show that TVET research has evolved from limited early contributions into a rapidly expanding field. The marked increase in publications after 2012 suggests the influence of international frameworks that strengthened the positioning of TVET in global education systems. This observation aligns with UNESCO (2022), which highlights the growing importance of TVET in supporting lifelong learning and sustainable development goals. The shift also reflects how research responds to global labor market transformations and technological advancements. With regard to the second research question, the study identified a concentration of scholarly influence among a relatively small group of authors, journals and countries. Leading journals such as the *Journal of Vocational Education and Training* play a central role in disseminating high impact research, while countries like the United Kingdom, Malaysia, and Germany dominate in terms of publication output. This pattern is consistent with earlier findings that research productivity and influence are often concentrated in regions with strong academic and institutional support (Aria & Cuccurulo, 2017). Furthermore, the presence of prolific authors suggests the existence of core knowledge producers who significantly shape the direction of the field. In relation to the third research question, the thematic ad network analyses demonstrate that TVET research is both interconnected and multidisciplinary. Core themes such as vocational education, assessment and workplace learning remain central, indicating their continued relevance in the field. At the same time, emerging topics such as digital transformation, green TVET and social inclusion highlight the responsiveness of research to contemporary global challenges. These findings are supported by recent studies emphasizing the integration of digital competencies and innovative teaching approaches in vocational education (Ma & Ismail, 2025; Othman et al., 2026).

The conceptual structure and co-occurrence analysis further reveal that TVET research is organized around three major dimensions: education systems, pedagogy and

employability. This structure reflects a balanced integration of theory and practice, ensuring that educational frameworks are aligned with labor market needs. Prior research also supports this perspective, noting that effective TVET systems must bridge the gap between classroom instruction and workplace application (Smith & Kelsey, 2021). Additionally, the strong presence of collaboration networks highlights the importance of knowledge sharing among researchers, which has been identified as a key factor in advancing scientific fields (Glanzel & Schubert, 2004). Despite these contributions, the findings also reveal gaps in the literature. Themes such as gender, entrepreneurship, and adult education remain underdeveloped or emerging, suggesting the need for further research in these areas. This observation is consistent with studies indicating that inclusive and diversified research agendas are essential for addressing the broader social dimensions of TVET (McGrath et al., 2020). Overall, the study not only maps the current state of TVET research but also highlights areas for future development and deeper investigation.

Strengths of the Study

The study demonstrates several strengths that enhance its contribution to the field. First, it provides a comprehensive analysis of 644 publications over a 25-year period, offering a broad and reliable overview of TVET research trends. Second, the use of advanced bibliometric tools such as Bibliometrix and VOSviewer ensures accurate analysis and clear visualization of research patterns and networks. Third, the selection of well-established and indexed journals enhances the credibility and quality of the dataset. Finally, the study adopts a multi-dimensional approach by combining citation, co-authorship, and keyword analyses, allowing for a deeper and more holistic understanding of the field.

Limitations of the Study

Despite its contributions, the study has several limitations. The reliance on a single database (lens.org) may have resulted in the exclusion of relevant studies from other databases such as Scopus and Web of Science. Additionally, the focus on only three journals may limit the scope of the findings across the broader TVET research landscape. The inclusion of only open-access publications may also introduce selection bias, as some high-impact studies may not be freely accessible. Lastly, the descriptive nature of bibliometric analysis limits the ability to explore the deeper qualitative aspects of the research content.

Conclusion

This bibliometric analysis offers a clear and systematic understanding of the development of TVET research from 2000 to 2025. The findings demonstrate that the field has grown significantly, with increasing research output, expanding global participation, and evolving thematic focus. The study confirms that TVET has become a highly relevant and dynamic area of research, driven by global demands for skills development, employability and sustainable economic growth. A small group of influential authors, leading journals, and key countries continue to shape the field while emerging themes such as digitalization, sustainability, and inclusion reflect current global priorities. These results have important implications for educators, policymakers and researchers. They highlight the need to strengthen the alignment between education and industry, promote inclusive and innovative learning approaches, and support international collaboration. Future research should consider expanding data sources, including more diverse regions, and

integrating qualitative approaches to gain deeper insights into the content and impact of TVET studies. By addressing these areas, the field can continue evolve and effectively respond to the challenges of the modern workforce.

Recommendations

Based on the findings, several recommendations are proposed. Future studies should expand data sources to include multiple databases for more comprehensive coverage. Researchers are encouraged to include a wider range of journals and interdisciplinary perspectives to better capture the diversity of TVET research. There is also a need to explore underrepresented themes such as gender, entrepreneurship, and adult learning to promote inclusivity in the field. Strengthening international collaboration, particularly involving developing countries, can help balance global research contributions. Finally, integrating qualitative methods with bibliometric analysis can provide deeper insights into the impact and practical relevance of TVET research.

Author Contributions

Valenzuela, D. J.: Conceptualization, methodology, software, formal analysis, data curation, and writing original draft preparation.

Cubian, R. M.: Validation, investigation, resources, writing review and editing, and supervision.

Funding Statement

This research received no external funding.

Ethical Considerations

Not applicable. This study employed a bibliometric approach using publicly available data from Lens.org and did not involve human participants.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Use of Artificial Intelligence Tools

The author's utilized artificial intelligence (AI) tools, specifically Gemini, to assist in organizing and drafting selected sections of the manuscript. All outputs were critically reviewed, revised, and approved by the authors, who assume full responsibility for the content of this publication.

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